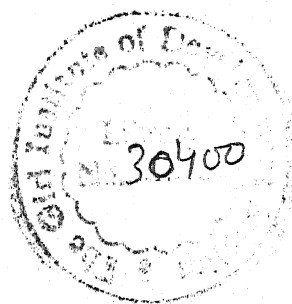


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TRENDS IN HORTICULTURE DEVELOPMENT IN UTTARAKHAND

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I. INTRODUCTION:

Despite several development programmes introduced and efforts undertaken in the past for developing backward and hill areas under the various planned development strategies with the intention of bringing reduction in longstanding inequalities existing in the process of economic development and growth among different regions the concerned problem of balanced regional development is still largely prevailing in India. In fact, the economy of already developed regions has been growing faster while the backward and hill regions have remained economically handicapped. Instead, the disparities in the economic growth between these two groups of regions have been widening over the years.

In this context, the growing debates among social scientists, policy makers and planners have, therefore, increasingly been attached with the concern that how various developed programmes initiated in the past plans have

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increasingly been more beneficial for already developed regions. Despite the fact that the most hill areas/regions have several region specific comparative advantages for developing certain economic activities and are possessing various categories of natural resources in abundance which can increasingly contribute to economic growth and development at a possible extent. In addition to this, the Central Government is also playing an important role, besides directly planning development of certain sectors of national and inter-state significance, in providing financial resources to support state plans and centrally sponsored programmes.

The basic and foremost problem with the development plans for backward and hill areas has not been the lack of general awareness about the problems of concerned areas, nor the lack of sincerity on the part of the central and state planners, but rather the absence of an integrated and region-specific approach to thinking about, planning for and implementing these development programmes. Inadequate recognition was provided to develop comprehensive planning approach keeping into consideration the development potential of different economic activities and sectors in different hill regions. Identification of certain potential economic sectors and planning for developing concerned activities on systematic approach basis would have considered as an important measure of development for hill areas.

Uttarakhand, mainly a mountainous and hilly part of Uttar Pradesh, is well recognised as an underdeveloped region in India. Agriculture and its related activities are forming the economic base and main source of livelihood and

employment for the people living in the region. The agricultural activities are neither in a position to provide gainful employment opportunities on regular basis nor the income for sustaining minimum standard of living of the households. However, due to non-availability of employment and income opportunities in remaining economic sectors, such as manufacturing and tertiary economies the pressure of population is consistently increasing on it for both employment and livelihood.

It has universally been recognised that the development of agricultural sector through increasing per hectare productivity is not possible beyond a point. Several geographical factors including the nature of terrain, scattered marginal and steep sloppy land holdings, scanty cultivable land and difficult agriculture conditions are limiting the scope of developing agriculture in the region. The use of improved variety seeds, modern fertilizers, pesticides and chemical so as to increase yield rates of food grains is also restricted by the fact that sizably a larger cultivated land area is lacking the facility of irrigation. Also the small size of land holdings available with a majority (94 per cent) of cultivating households are limiting the scope for using improved technology of farming.

The possibility of diversification of economy on a large scale through developing industrial activities is also not possible due to various environmental and ecological constraints, emerging in the expansion and establishment of certain large-scale industrial units in Uttarakhand. And, thus the creation of employment opportunities because of the increasing

labourforce, has been a serious problem of discussions among the planners and policy makers those are engaged on the development issues of Uttarakhand. In the presently emerging problem of increasing unemployment and lack of alternative sources of employment and income in other economic sectors the agricultural activities are expected to remain the mainstay of the people of Uttarakhand. Therefore, increasing emphasis should be provided for the diversification of agriculture itself by way of introducing the high value crops in the cropping system so as to maximise the income level of farming households and employment opportunities. In this regard horticulture is emerging as the strongest option for promotion in various areas of Uttarakhand which not only can create the increasing employment and income opportunities but its development will also be an instrumental measure for improving the environmental situation.

II. POTENTIAL OF HORTICULTURE DEVELOPMENT:

The Uttarakhand region has proved to be suitable for growing different types of temperate, sub-tropical and tropical fruits. Also the region has wide scope for growing different kinds of vegetables, flowers, ornamental plants, mushrooms and medicinal plants in its different climatic zones. Temperate fruits such as apple, pear, peach, plum, apricot, cherry, walnut, hazelnut are grown at elevation from 1000 to 3000 msl. And at elevation ranging from 3000 to 1400 metres, sub-tropical fruits such as citrus, mango, litchi, Lucas, banana, guava, papaya, strawberry and different vegetables are grown successfully. Also flowers such as gladiolus, carnation, lily, dahlia, tuberose,

are also produced in different areas of hill region at a time when they cannot be produced in the plain areas while tulips, daffodils, red-hot poker and other flowers can only be produced in the hills. Various hilly areas have also been recognised suitable for producing mushroom and bee keeping.

III. PAST INITIATIVES AND APPROACHES:

Considering the favourable agro-climatic condition and suitable atmosphere for growing different categories of fruits in different areas of Uttarakhand a high priority has been accorded in the past development plans to develop horticulture and its related activities in the region. In addition to this, the importance of developing horticulture has also been more particularly attached in view of creating additional opportunities of employment and income for the increasing level of labourforce. Reviewing the initiatives undertaken towards the development of horticulture and horticulture related activities in Uttarakhand it revealed the fact that increasing emphasis has been provided in increasing land area under the plantation of different fruits and growing of vegetables and spices. Emphasis has also been laid on the development of floriculture, ornament gardening, mushroom, food processing and bee keeping in different areas of the region. The Central as well as state Government have introduced various schemes and development programmes for developing horticultural produce and off-seasons vegetables in the region.

IV. SCHEMES AND PROGRAMMES:

1. Free distribution of vegetable minikits,
2. Assistance on development of spices
3. Full subsidy on the transportation of fruit plants, vegetable seeds, seeding, seed potato and plant protection chemicals.
4. Seventy five per cent subsidy on adopting the measures to control white grub infestation against potato and vegetable crops.
5. Provision of providing fifty per cent subsidy on the cost involved in plant protection, tools for horticulture, development of irrigation facilities, planting materials, establishment of orchards and rejuvenation of old orchards, potato demonstration, etc.
6. Provision of providing stipend for providing training to fruit growers and fifty per cent subsidy on the purchase of horticulture tools.
7. Provision of free demonstration of various off season vegetables and spices and its training to growers.
8. Long term subsidy cum loan facility.
9. Provision of short term training for aspects related to cultivation and gardening to the growers of mushroom and vegetables and one and half month training of bee keeping.

In addition to various schemes and development programmes introduced for the diversification of horticulture in the region the Department of Horticulture and Fruit utilisation provide extension services to the orchardists and growers to lay out new orchards, select varieties of fruits and vegetables for different areas, supply true-to-type planting materials and provide appropriate

technological and know-how guidance such as training, pruning, pest and diseased control, harvesting, grading and packaging. In all 186 mobile teams are involved in providing these extension services throughout the region. Initiatives towards the promotion of horticulture in different areas of region have been undertaken through establishing nurseries by Government itself and motivating private organisations and individuals for the establishment of fruit orchards. At present 75 Government nurseries and 57 private nurseries are established in growing and distribution of different horticulture plants to the farmers through Block office.

In addition to these nurseries, there are 20 progeny orchards, 9 Government gardens, 10 potato seed multiplication farms, 7 vegetable seed production farms, 5 elite gardens, 45 fruit preservation centres and 12 horticulture experiment and research centres in the region. Annually, around 2500 lakhs fruit plants, 235 qtl vegetable seeds, ten thousand qtl potato seeds are being produced from these production centres. In order to increase home scale preservation of fruits and vegetables, annually about 14 thousand house wives are trained.

In this manner the main emphasis of the past plans has been to boost up production and productivity of different horticulture crops and vegetables through providing increasing emphasis on the measures associated to the diversification of plantation of fruits, bringing increasing land area under horticulture, introducing improved technology of production and post harvest management, improved variety horticultural plants and its proper distribution

among fruit growers and initiating measures for the control of pests and diseases. Compact area approach has also been followed in order to minimise transportation, processing and properly marketing of different fruits and vegetables from different fruit growing destination to minimise the cost of production such that the margin of gains to the growers be maximised. The provision of providing transport subsidy on the transportation of fruit plants, vegetable seeds and seeding was introduced by the State Government in 1973-74. During the period of Eighth Plan (1992-97) the share of expenditure carried out on transport subsidy was (16.85 per cent) in the total plan expenditure of Rs.2309.44 lakh. The World Bank has also been significantly contributing in the integrated development of horticulture in Uttarakhand since 1990-91. In this regard, the Work Bank has provided an assistance of Rs.191.53 lakh during the period of Eighth Plan.

V. PLAN EXPENDITURE:

Considering the importance of horticulture developed in Uttarakhand as an alternative option for creating additional employment opportunities and livelihood for increasing population and environmental regeneration, various centrally and state sponsored projects and programmes have been initiated for bringing increasing land area under the plantation of different fruits in different geographical locations and diversification of horticulture and vegetables with providing due consideration in bringing improvements in the quality of seeds, fruit plans, properly distribution of pesticides, controlling of pests and diseases and introducing various financial packages and incentives for attracting growers for promoting horticulture and vegetables during the

various development plans in the past. Accordingly, increasing emphasis has been provided to allocate a significant amount of finances for the development and diversification of horticulture and vegetables in Uttarakhand. Although, a larger extent of inconsistency is found prevailing in allocating funds for the development of horticulture sector during the period of the past plans.

The actual expenditure incurred in the development of different horticulture related activities during Eighth Five Year Plan was Rs.2,388 lakh while the budgetary provision for this sector has declined at Rs.2,000 lakh for the Ninth Plan periods. The share of plan expenditure on horticulture development to total plan expenditure had been only 1.10 per cent during Eighth Plan. In fact the corresponding share of expenditure on horticulture sector had declined at 0.45 per cent for Ninth Plan period, though it marginally increased at 0.53 per cent during 1997-98, but the share of expected expenditure for the period 1999-2000 is indicated to be only 0.48 per cent. The overall pattern of inconsistencies prevailing in the introduction of short term and ad-hoc nature of several programmes and projects, expenditure and budgetary provision during different plans in the past for the horticulture development shows a clear-cut lack of understanding from the part of planners and policy makers about the potential and comparative advantages of developing horticulture sector over the remaining productive economic sectors, such as agricultural and industrial activities those development is seriously restricted by certain geographical problems and environmental and ecological considerations. For instance the schemes such as development of tissue culture, development of canning and training centres, subsidy on interest for certain purposes and

introduction of training programmes etc. had been for shorter duration and on ad-hoc basis during different plans periods in the past. In addition to this, certain other factors such as carrying out construction activities, expenses incurred on capital and office equipments and the establishment of fruit processing units in some of the years had also shown inconsistencies in expenditure pattern over the years.

Analysing the pattern of expenditure carried out on different aspects of different purposes for horticulture development during last five years it revealed that overall plan expenditure has increased from Rs.419.60 lakh in 1992-93 to Rs.586.70 lakh during 1996-97, showing an annual growth rate of around 8 per cent. Significantly larger share of plan expenditure has gone in favour of growing and development of different varieties of fruits during each reference period. It was highest during 1996-97 (65.53 per cent) followed by around 64 per cent during each 1992-93 and 1994-95 and was lowest during 1993-94 (51.83 per cent). Development of Mushrooms has been receiving significant importance in the region over the years. The plan expenditure on developing mushroom and training to farmers has been increasing at the rate of 22.57 per cent annually. The share of general expenses on training, research, establishment, subsidies etc. is ranging between 6.91 per cent to 42.63 per cent and it has been increasing at the rate of 18.88 per cent over the years. The lowest growth of plan expenditure has been observed in the plantation of fruits (3.85 per cent) followed by bee keeping (4.17 per cent) while negative growth rate of 16 per cent in the plan expenditure is observed in the case of developing floriculture and ornaments in the region.

TABLE 1 : PLAN EXPENDITURE ON THE DEVELOPMENT OF HORTICULTURE AND VEGETABLES

| | Head of Expenditure | EXPENDITURE IN DIFFERENT YEARS | | | | | Annual Percent -age growth |
|---|----------------------------|--------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------------------------|
| | | 1992- 93 | 1993- 94 | 1994- 95 | 1995- 96 | 1996- 97 | |
| 1 | Fruits | 267.48 (83.75) | 264.16 (51.83) | 193.78 (63.87) | 214.85 (54.55) | 218.92 (65.53) | 3.85 |
| 2 | Vegetables | 13.63 (3.25) | 16.21 (3.18) | 23.61 (7.78) | 12.19 (3.10) | 22.53 (4.63) | 13.06 |
| 3 | Floriculture and Ornaments | 14.11 (3.37) | 27.40 (5.38) | 3.20 (1.06) | 0.66 (0.17) | 3.25 (0.67) | -16.00 |
| 4 | Mushrooms | 14.36 (3.43) | 32.86 (6.45) | 22.72 (7.49) | 35.56 (9.03) | 30.56 (6.28) | 22.57 |
| 5 | Fruit Processing | -- | 4.20 (0.83) | -- | -- | -- | -- |
| 6 | Bee Keeping | 3.31 (0.79) | 3.65 (0.72) | 3.35 (1.11) | 4.65 (1.16) | 4.00 (0.63) | 4.17 |
| 7 | Others | 106.71 (25.44) | 35.18 (6.91) | 56.78 (18.72) | 125.95 (31.98) | 207.44 (42.63) | 18.88 |
| | TOTAL | 419.60 (100.0) | 509.66 (100.0) | 303.44 (100.0) | 393.86 (100.0) | 586.70 (100.0) | 7.96 |

Note: Figures in brackets indicates the percentages of totals

VI. DEVELOPMENT OF HORTICULTURE:

- (a) **CHANGING SHIFTS IN LAND USE:** The unprecedented increase in population and its addition to labourforce during the recent past has been causing undesirable pressure on the stagnant agriculture, both for livelihood and employment. This emerging situation has increased the importance of horticulture development so as to increase the opportunities of employment for increasing labourforce and sustaining livelihood of rural population. Growing different varieties of fruits and vegetables has been gaining importance in almost all the locations of Uttarakhand. The farmers have been well aware about the economic benefits that can be derived through using available land area with them in the production of high value commercial crops instead of utilising it for growing traditional low value crops. Increasing development of basic infrastructural facilities, basically improvements in access to transport and communication facilities in most of the areas, has also been recognised increasingly been motivating the farmers, including small and marginal farmers, in shifting their land towards the plantation of fruit trees and cultivation of off season vegetables.

TABLE 2 : CHANGES IN CROPPING PATTERN

| Sl No | CROP | Land Area | | Percentage Change | Annual Growth |
|-------|------------|---------------------|---------------------|-------------------|---------------|
| | | 1992-93 | 1997-98 | | |
| 1. | Foodgrains | 949877 (73.75) | 896052 (71.36) | -5.67 | -0.94 |
| 2. | Fruits | 179200 (13.91) | 187870 (14.96) | +4.84 | +0.81 |
| 3. | Vegetables | 78038 (6.06) | 85069 (6.78) | +9.01 | +1.50 |
| 4. | Pulses | 29425 (2.26) | 30637 (2.46) | +4.80 | +0.80 |
| 5. | Others | 51444 (3.99) | 55867 (4.45) | +8.60 | +1.43 |
| | ALL CROPS | 1287984 (100.00) | 1255695 (100.00) | -2.51 | -0.42 |

Note: Figures in brackets indicate the percentages of totals

Increasing importance of horticulture and growing vegetables in Uttarakhand is well recognised by the fact that the land area under the production of foodgrains has been consistently decreasing while it has been increasing under the production of fruits and vegetables over the years, though over 71 per cent of the available land area is still utilised under the production of foodgrains. The land area under the cultivation of foodgrains has declined from 949.88 thousand hectares in 1992-93 to 896.05 thousand hectares during the period 1997-98 with a decline at 5.67 per cent. However, the land area used under the plantation of fruits has increased from 179.20 hectares in 1992-93 to 187.87 thousand hectares in 1997-98 showing an overall increase of 4.84 per cent. The highest level of increase in using of land area has been reported in the case of vegetables, mainly the cultivation of potato. During the

period 1992-93 and 1997-98, around 7031 hectares additional land area has been diverted by the farmers from the cultivation of foodgrains to the growing of different vegetable crops. Also significant increase has been indicated in the land area utilised under the production of fruits. The share of land used for growing fruits has increased from 13.91 per cent during 1992-93 to 14.96 per cent during 1997-98. However, the highest growth in the area has been reported under the production of vegetables (9.01 per cent) followed by crops listed in other category which include sugarcane (8.60 per cent), fruits (4.84 per cent) and pulses (4.80 per cent); but a negative growth rate of 5.67 per cent has been observed in the area based under the production of foodgrains.

(b) **CHANGES IN LAND AREA, PRODUCTION AND PRODU-**

CTIVITY OF FRUITS: The examination of changes in the pattern of land use, production and productivity of different fruits has been carried out through analysing the time series data for the periods 1984-85 to 1998-99. The analysis reveals that the land area under fruits has been consistently increasing over the years. Taking 1984-85 as the base year the indices of land area for fruits have increased around 132 per cent points during 1998-99, showing an overall growth rate of 30.99 per cent. The productivity of various fruits is also consistently increasing, with the increasing trend of area being utilised for growing fruits production, in fact more sharply than the growth of land area in the region. The total production of fruits in Uttarakhand has increased from Rs.3.30 lakh tonnes in 1984-85 to Rs.5.20 lakh tonnes in 1998-99

TABLE 3 : AREA, PRODUCTION AND PRODUCTIVITY OF FRUITS

| Items | 1984-85 | 1992-93 | 1993-94 | 1994-95 | 1995-96 | 1996-97 | 1998-99 | Growth Percent- age |
|--------------------------------|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|---------------------------|
| Area (Lakh hect.) | 1.42 (100.0) | 1.76 (123.94) | 1.79 (126.06) | 1.82 (128.17) | 1.84 (129.58) | 1.86 (130.99) | 1.88 (132.39) | 32.39 |
| Production (Lakh Tonnes) | 3.30 (100.0) | 4.62 (140.00) | 4.69 (142.12) | 4.95 (150.00) | 5.02 (152.12) | 5.10 (154.55) | 5.20 (157.88) | 57.58 |
| Productivity (Tonnes/Hect.) | 2.30 (100.0) | 2.62 (113.91) | 2.62 (113.91) | 2.72 (118.26) | 2.73 (118.70) | 2.75 (119.57) | 2.77 (120.43) | 2.43 |

indicating the growth of 57.58 per cent. In other words, it may be well mentioned here that bringing out 44 thousand hectare land area under the plantation of different fruits has increased 190 thousand tonnes of additional fruits in the region. The per hectare productivity of fruits which was 2.30 tonnes in 1984-85, it has achieved the level of 2.077 tonnes/hectare during 1998-99 showing an increase of 20.43 per cent. Apple are the most important among the various fruits grown in the region and are cultivated on 54 thousand hectares of land which accounts 77.14 per cent of the total land area of all fruits.

Uttarakhand has made significant progress in the matter of horticulture development during recent past. Compared to the production of 308 tonnes of fruits in 1987-88 (and 197 thousand tonnes in 1988-89) from 149 thousand hectares of plantation of fruits in Himachal Pradesh, Uttarakhand's 166 thousand hectares of horticultural farms produced 398 tonnes of apples, peaches, citrus fruits, mangoes, plums, apricots, walnuts, lichis and other fruits in 1989-90. Although, the yield rate of

apple is quite low (3.5 tonnes/hectares) in Uttarakhand (compared to 7.0 tonnes/hectares in Himachal Pradesh and 12.0 tonnes/hectares in Jammu and Kashmir). The per hectare yield of temperate fruits other than apples and subtropical fruits is substantially higher in Uttarakhand. Also, the land under temperate and tropical fruits and its productivity in Uttarakhand is significantly higher than in Himachal Pradesh.

- (c) **CHANGES IN AREA, PRODUCTION AND PRODUCTIVITY OF VEGETABLES:** As indicated in the preceding analysis that growing vegetables through shifting available land from the cultivation of traditional foodgrains is receiving significant and increasing importance in the economy of Uttarakhand. The general trend has not been limited only in diverting land into the production of various vegetables but equally important feature has been to adopt modern technologies of production, improved variety seeds, chemicals and fertilizers such that the economic benefits from land can be maximised by way of increasing the production of vegetables. We thus, find the volume of production as well as per hectare productivity of land is consistently increasing over the years. The land area under the cultivation of vegetables has increased from 46 thousand hectares to 90 thousand hectares with an increase of 95.65 per cent during the period 1984-85 to 1996-97. Annually, on an average, 3.7 thousand-hectare land is additionally been brought out under the production of various vegetables in the region during last twelve years. Further, it is indicated that the volume of production of vegetables is increasing at

much faster rate than the increase of land area. During 1984-85 to 1996-97, the production of vegetables increased from 2.79 lakh tonnes to 8.17. Consequently, the productivity of vegetable has shown remarkable increase over the years. This has increased from 6.06 tonnes/hectares in 1984-85 to 9.08 tonnes/hectares during 1996-97 showing an overall increase of 49.83 per cent. The analysis on the process of development of vegetable cultivation is clearly indicating the fact that the farmers are increasingly shifting their available land in growing different vegetable crops instead of its utilisation in growing traditional crops. Increasing attention has also been provided by the farmers in adopting various technologies and methods require for upholding and strengthening farm productivity of vegetables. With these efforts, annually, the volume of production of vegetables has been increasing over 16 per cent as against 7.98 per cent increase of land area under the production of vegetable. If this trend of shifting land into the production of vegetables and the trend of increasing productivity of different vegetables is sustained the growing problem of poverty among marginal and small farmers can be reduced at significant level. However, at present lack of proper marketing facilities and absence of post-harvest technologies and storage are serious constraints to a more rapid and systematic development of both fruits as well as vegetable cultivation and marketing in the region.

TABLE 4 : AREA, PRODUCTION AND PRODUCTIVITY OF VEGETABLES

| Items | 1991-92 | 1992-93 | 1993-94 | 1994-95 | 1995-96 | 1996-97 | Growth Percent- age |
|--------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|---------------------------|
| Area (Lakh hect.) | 0.46 (100.00) | 0.80 (173.91) | 0.84 (182.61) | 0.87 (189.13) | 0.88 (191.30) | 0.90 (195.65) | 95.65 |
| Production (Lakh Tonnes) | 2.79 (100.0) | 6.87 (246.23) | 7.18 (257.35) | 7.50 (268.82) | 7.90 (283.15) | 8.17 (293.83) | 192.83 |
| Productivity (Tonnes/Hect.) | 6.06 (100.0) | 8.59 (141.74) | 8.55 (141.09) | 8.62 (142.24) | 8.98 (148.18) | 9.08 (149.83) | 49.83 |

VI. OPTIONS FOR STRENGTHENING HORTICULTURE DEVELOPMENT:

Over and above, it is clearly depicted that over the years, the farming community having either lower or higher size of land holding in possession, has become quite aware of the fact that a shift of available land from the production of low value crops to relatively high value commercial crops has significant advantages in terms of achieving higher returns. This can be well recognised by the fact that the area under different fruits and vegetables have increased consistently over the years. Therefore the mobilisation of public support for this purpose may not be a difficult task, but some farmers, particularly those possessing small size of land holdings, are hesitant to adopt changes because of high production and market risks; and if this is not handled properly, it could deprive farmers even of the limited subsistence they now derive from food crops.

The potentials of developing horticulture in different areas of the region have been well realised by the farmers and they are keen to engage in growing different fruits and vegetables provided proper marketing arrangements are available for disposal of their produce. A case study revealed that nearly 63 per cent of fruit growers have expressed a desire to diversify and expand orchard size by additional plantation of fruits. Farmers who are not currently engaged in growing fruits would also like to do so, but the problem of marketing possess a major constraint in diverting their land from the cultivation of traditional low value crops to the plantation of fruit trees (Mehta 1988). The advance or pre-arranged sale of orchard crops is the most prevalent marketing arrangement in the region, and it favours fruit contractors rather than fruit growers; as the contracted prices are usually significantly lower than market prices (Mehta 1988). At the same time fruits grown in remote and less accessible areas do not find a convenient market; collection of fruits from these areas, even by contractors, is difficult. As a result, most of it used for either domestic consumption or goes waste.

The emerging marketing problems could be solved by organising fruit growers to form co-operative societies and developing of fruit mandies (markets) and marketing centres in different fruit growing areas. This could be a necessary and effective step for the development of horticulture in Uttarakhand. This would also prevent perpetuation of the inequitable linkages prevailing between fruit growers and contractors. As a result of poor economic conditions of many fruit growers, the system of pre-harvest

contracting is perpetuated because they receive part of the payment in advance from the pre-harvest contractors, so as to purchase fertilizers, chemicals, irrigation, pesticides and medicines required before harvesting fruits. Marketing arrangements, therefore would need to ensure sale of fruits at remunerative prices and to make available crop-credit from banks and other financial institutions. A network of co-operative societies including primary credit societies, would probably be most effective system for this purpose. In addition to these initiatives, it would be also equally necessary to provide easy access to support services, such as seeds, fertilizers, production techniques, improved agricultural services and methods, and marketing infrastructure in order to increase yield levels and minimise the risks involved in the shift from food-centred subsistence production to niche-based commercial production.

The fruit trees require a duration of nearly five to six years to develop before they can bear fruits and earn income. Therefore, the shift from the production of foodgrains to the plantation of fruits would initially mean hardship for the farmers, particularly those owning very small pieces of land. So the farmers should be encouraged and helped to carry out inter-cropping on land where fruit trees are grown. Various high-value commercial crops have to be identified by carrying out research on the quality and suitability of soils for growing particular crops. A study by Karane (1996) reveals that studies carried out over a period of four years on raising pecan nut trees in different crop sequences have clearly shown that soybeans during kharif crop season and peas in rabbi crop season successfully complemented the nut trees. In

fact, soybean performed consistently well in association with trees rather than a sole crop. Inter-cropping in between fruit trees with oil seeds and local varieties of pulses has been quite successful over a period of four to five years in most orchards in Nainital and Almora, in fact the value of pulses and oil seeds grown as an inter-crop is estimated to be much higher than when traditional crops were grown on the same land. Nevertheless in some areas, around 20 to 35 per cent loss in production of agricultural crops as a result of enter-cropping with fruit trees has been estimated (Mehta 1996). The yield will of course be relatively lower than while cultivating food crops without fruit trees, but at least some food requirement will be met. In addition, on going employment programmes run by the central and state governments, such as Jawahar Rozgar Yojana, especially its employment assurance scheme, which aims to provide income to poor households through wage-employment, could be applied, with suitable modifications, if necessary, to provide food security to farmers who are shifting to non-food crops. Further, shifting to cultivation of fruits and vegetables means that the public distribution system should be strengthened to ensure that adequate quantities of food grains are available and at affordable prices.

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